To: John Schilling

From: Keith G. Papke

Subject: Sulfur deposits in Nevada

Memorandum
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Reno, Nevada

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Introduction

As you requested I have visited the principal areas where sulfur occurs in Nevada. The following description tells of the current status of these deposits, their geology, and their probable economic potential. I have included in the introductory portion some information on the reasons for the current interest in sulfur.

Interest in sulfur deposits in Nevada probably is at an all-time high. This is a reflection of the current free world supply and demand situation. For three years demand has exceeded production and excess orders have been filled from stockpiles (private stockpiles; sulfur is not a government stockpile commodity). Demand for sulfur continues to grow at a rate of 6 to 7 percent a year. In 1965 free world production of all forms was 22,800,000 long tons. Recent estimates are for a consumption in excess of 30,000,000 long tons in 1970.

The fertilizer industry is the largest consumer. In 1965 the domestic phosphate industry used 6,700,000 long tons in the acidulation of phosphate rock with sulfuric acid. The most promising substitution in this industry is by nitric acid but this gives a more expensive and less suitable product. Sulfuric acid will probably be used as long as supply and price permit.

Sulfur to meet this demand will have to come mostly from reactivated and new Frash process installations along the Gulf of Mexico. The limitation of exports from Mexico to a percentage of newly-found reserves further complicates the situation. There will be increased yield from sour gas fields but the additional tonnage will be relatively small. Sulfur produced from deposits of the type found in Nevada and California will never be an important factor in supply. It is obvious that there will be abnormal interest in sulfur deposits until 1970 at least.

The shortage has caused a price increase but the amount is uncertain because quotations commonly give only nominal figures. Domestic bright sulfur has been quoted at $27 since 1964. In September of 1966 the E. and M. J. Metal Market, while still retaining this quotation, also quoted $39 f.o.b. Gulf ports for export and stated that the current spot market is about $42 f.o.b. mine.

7) Deep Gulch, Esmeralda County. This property is in Section 36, T. 4 S., R. 42 E., 12 miles south of Goldfield and 1 mile west of U. S. Highway 95. There was no activity at the property but it was relocated by a group of claims dated in May of 1966.

The sulfur occurs near the top of a prominent hill. Although outcrops are often poor, the entire hill over an east-west distance of about 800 to 1,000 feet appears to be made up of an altered breccia that contains some recognizable fragments of a fine-grained volcanic rock. There are some areas of intensely bleached and altered rocks and others where coarse, sinterous silica is abundant. At the very top of the hill - and overlying some of the sulfur - is a flat-lying, strongly silicified capping. The main bulk of the material, however, is a loose, unconsolidated breccia. Part of this, at least, is crudely bedded with a nearly horizontal attitude. The origin of the breccia is uncertain.

Most of the breccia contains no sulfur. There is some suggestion that the sulfur concentrations are along two north-south zones; there is practically no sulfur left in place so its original distribution is hard to determine. A west zone has been prospected or mined over a length of about 200 feet and a width of about 20 feet. A possible second zone about 100 feet to the east is less distinct. It is suggested by a short adit at the south end and an open cut and underground workings at the north end. Both of these mined areas are beneath the silicified capping; this fact plus the occurrence of several horizontal bands of sulfur suggest deposition beneath an impervious capping. The sulfur commonly replaces the matrix of the breccia and some is in fairly massive form. A small stockpile suggests that some relatively high-grade ore was shipped - perhaps 50 percent.

As in most of the other deposits, the possibility of finding an adequate tonnage to support a mill is quite small. A favorable factor here, however, is the relatively large area underlain by breccia as a potential host. It is likely that most recovery would have to be by underground methods in soft and ravelly ground.

Conclusion

Examination of Nevada sulfur deposits as a group has led to some conclusions.

1) There is no present production of sulfur and the possibility of finding large tonnages amenable to production of pure sulfur are poor.

2) Directly mined, high-grade ore - say over 70 percent - could be available in only small tonnages.

3) There is a better possibility of producing limited tonnages of sulfur rock for agricultural use. In relation to percentage of total sulfur, it might be advantageous from a price standpoint to produce agricultural sulfur.

4) Based on the evidence now available, I rate the properties in the following order of potential economic significance: a) Sulphur; b) Alum; c) Deep Gulch; d) Hot Springs Point; e) San Emidio; f) Tognoni; g) Humboldt; and h) Cuprite.

5) By-product material might enhance the value of some ores. This is particularly true of mercury. Cinnabar is known to be present in significant quantities at the Sulphur and San Emidio properties.

6) Transportation must be considered in property evaluation. The Sulphur, Hot Springs Point and Humboldt areas are well situated near railroads, but the others are poorly situated at distances of 45 miles or more from railroads. Soil conditioner, mainly for a central California market, might not be dependant upon railroad location; it might be better transported by truck.